

## What is Claimed is

- [c1] A micromachined device, comprising:
- a substrate;
  - an insulation layer formed over at least part of the substrate; and
  - a silicon layer formed over at least part of the insulation layer, the silicon layer including a silicon structure that is at least partially thermally isolated from the substrate by a gap in the insulation layer, wherein a surface of the substrate under the gap in the insulation layer is substantially unetched.
- [c2] The micromachined device of claim 1, wherein the substrate is made of silicon.
- [c3] The micromachined device of claim 2, wherein the silicon layer is a single crystal silicon layer.
- [c4] The micromachined device of claim 3, wherein the insulation layer is made of silicon dioxide.
- [c5] The micromachined device of claim 1, wherein the silicon structure is a thermo-optical switch.
- [c6] The micromachined device of claim 6, wherein the thermo-optical switch is a Mach-Zehnder switch.
- [c7] ✓ A method for fabricating a micromachined device, comprising:
- forming a substrate;
  - forming an insulation layer over at least part of the substrate;
  - forming a silicon layer over at least part of the insulation layer;
  - forming a silicon structure in the silicon layer; and
  - forming a gap in the insulation layer that at least partially thermally isolates the silicon structure from the substrate, wherein a surface of the substrate under the gap in the insulation layer is maintained substantially unetched.
- [c8] ✓ The method of claim 7, wherein forming the gap in the insulation layer comprises removing a portion of the insulation layer with an etch that does not

affect the substrate.

[c9] ✓ The method of claim 8, wherein forming the substrate comprises forming a silicon substrate and removing the portion of the insulation layer is with an etch that does not affect silicon.

[c10] ✓ The method of claim 7, wherein forming the substrate comprises forming a substrate of a first material, forming the insulation layer comprises forming a layer of a second material, and forming the gap in the insulation layer comprises removing a portion of the insulation layer with an etch that is highly selective between the first and second materials.

[c11] 10 } The method of claim 10, wherein removing a portion of the insulation layer with an etch that is highly selective between the first and second materials comprises removing a portion of the insulation layer with an etch having a selectivity of about 20:1 or greater.

[c12] ✓ The method of claim 7, wherein forming the substrate comprises forming a substrate of silicon, forming the insulation layer comprises forming a layer of a dielectric material, and forming the gap in the insulation layer comprises removing a portion of the insulation layer with an etch that is highly selective between the dielectric material and silicon.

[c13] ✓ The method of claim 7, wherein forming the substrate comprises forming a substrate of silicon, forming the insulation layer comprises forming a layer of silicon dioxide, and forming the gap in the insulation layer comprises removing a portion of the insulation layer with an etch that is highly selective between silicon dioxide and silicon.

[c14] ✓ A method for fabricating a micromachined device, comprising:  
forming a substrate;  
forming an insulation layer over at least part of the substrate;  
forming a silicon layer over at least part of the insulation layer;  
forming a silicon structure in the silicon layer; and  
forming a gap in the insulation layer without affecting a surface of the substrate underlying the gap.

- [c15] ✓ The method of claim 14, wherein forming the gap in the insulation layer comprises removing a portion of the insulation layer with an etch that does not affect the surface of the substrate underlying the gap.
- [c16] ✓ The method of claim 15, wherein forming the substrate comprises forming a silicon substrate and removing the portion of the insulation layer is with an etch that does not affect silicon.
- [c17] ✓ The method of claim 14, wherein forming the substrate comprises forming a substrate of a first material, forming the insulation layer comprises forming a layer of a second material, and forming the gap in the insulation layer comprises removing a portion of the insulation layer with an etch that is highly selective between the first and second materials.
- [c18] 103 The method of claim 17, wherein removing a portion of the insulation layer with an etch that is highly selective between the first and second materials comprises removing a portion of the insulation layer with an etch having a selectivity of about 20:1 or greater.
- [c19] ✓ The method of claim 14, wherein forming the substrate comprises forming a substrate of silicon, forming the insulation layer comprises forming a layer of a dielectric material, and forming the gap in the insulation layer comprises removing a portion of the insulation layer with an etch that is highly selective between the dielectric material and silicon.
- [c20] ✓ The method of claim 14, wherein forming the substrate comprises forming a substrate of silicon, forming the insulation layer comprises forming a layer of silicon dioxide, and forming the gap in the insulation layer comprises removing a portion of the insulation layer with an etch that is highly selective between silicon dioxide and silicon.

AS  
WMS  
09683533-01.1602